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## HAILSTORMS IN MICHIGAN, 1920-1923

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[Weather Bureau Office, Lansing, Mich., Dec. 21, 1923]

The amount of damage done by hailstorms is difficult to estimate. Hail may fall on a young and tender growing crop and practically destroy it, but there is no way of determining what the crop would have produced had the hailstorm not occurred.

In recent years insurance against damage to farm crops is becoming quite common. Considerable amounts are paid each year in losses due to hailstorms. A study of the records of such companies perhaps furnishes one of the best means of determining the total extent of damage to farm crops. This method, in connection with reports from cooperative observers of the Weather Bureau and responses to special requests sent to postmasters and others in regions where hailstorms have been known to occur, was used in studying hail damage in Michigan during the years 1920 to 1923, inclusive.

The Michigan Mutual Hail Insurance Co., composed of farmers in this State, insures against hail damage to various crops, and the officials of this company were kind enough to give the Weather Bureau office at Lansing access to their records and also aid in estimating the total probable damage in certain storms, including that on farms which were not insured. The method used was to multiply the actual damages paid by a factor representing a ratio between the property insured in a section of county and the total area. This was supplemented by estimates of damage received from the other sources mentioned.

For example, if 5 per cent of the farms in a certain county were insured and the damages paid in a certain storm totaled \$100, then the total damage was estimated at \$2,000, unless an observer on the field estimated the damages to be much greater or less, when the figures were increased or decreased accordingly.

The method is open to considerable possible error, and yet it indicates in a general way the extent of damage. By this system, out of 601 storms reported in the four years, the total damages was estimated at \$2,610,678, or \$652,670 per year. By years the records are as follows:

Year	Number of storms	Total damage
1920.....	175	\$689,305
1921.....	200	1,011,845
1922.....	120	572,300
1923.....	106	337,228

July had by far the largest number of storms, and also the greatest amount of damage resulted during this month. During the four years there were 176 storms recorded in July, with a total damage estimated

at \$1,223,161. August came next, with 110 storms and \$737,340 estimated damage. June follows, with 95 storms and \$435,733 damage. Next in order are September, May, April, and October. No storms were recorded between November 1 and March 31 in any of the four years.

The distribution of hailstorms over the State each year for the three years combined is shown in Figures 1-8. From these it will be noticed that: (1) Very few hailstorms are recorded north of a line from Lake Huron, near Omer, Arenac County, westward to the Lake Michigan shore near Benzonia, in Benzie County, except the middle portion of the upper peninsula. (2) The number of hailstorms along the windward shore of the lower peninsula are remarkably small. (3) The area having the greatest number of storms extends in a southwest-northeast direction in the shape of a fan, with the extreme totals at some distance from Lake Michigan, across which the prevailing wind blows. This proves conclusively that the Lakes are effective agents in preventing the vertical circulation which produces hailstorms and tornadoes. It is interesting that the region of greatest frequency of tornadoes in Michigan is practically coincident with the area of greatest frequency of hailstorms.

The paths of some hailstorms could be traced across two or three counties, but the width is usually not greater than one township. In some cases two or three storms, with parallel paths, evidently occurred about the same time.

A detailed statement of the location, date, and extent of damage of each storm follows:

### HAILSTORMS IN MICHIGAN, 1920

*April 4.*—Light hail reported near Kalamazoo, Kalamazoo County.

*April 11.*—Light hail reported near Saginaw, Saginaw County.

*April 20.*—Light hail reported near Iron River, Iron County.

*April 22.*—Light hail occurred near Bloomingdale, Van Buren County; Allegan and Otsego, Allegan County; Saginaw, Saginaw County; Arbel, Tuscola County; Plainwell, Allegan County; St. Joseph, Berrien County; Hillsdale, Hillsdale County; Lansing, Ingham County; Monroe, Monroe County; Eloise, Wayne County; Luther, Lake County; Benzonia, Benzie County; Grand Rapids, Kent County; Iron Mountain, Iron County. No damage reported at any of these places.

*May 5.*—Light hail reported near Humboldt, Marquette County.

*May 19.*—Light hailstorm near Marquette, Marquette County.



FIG. 1.—Hailstorms in April, 1920-1923, inclusive

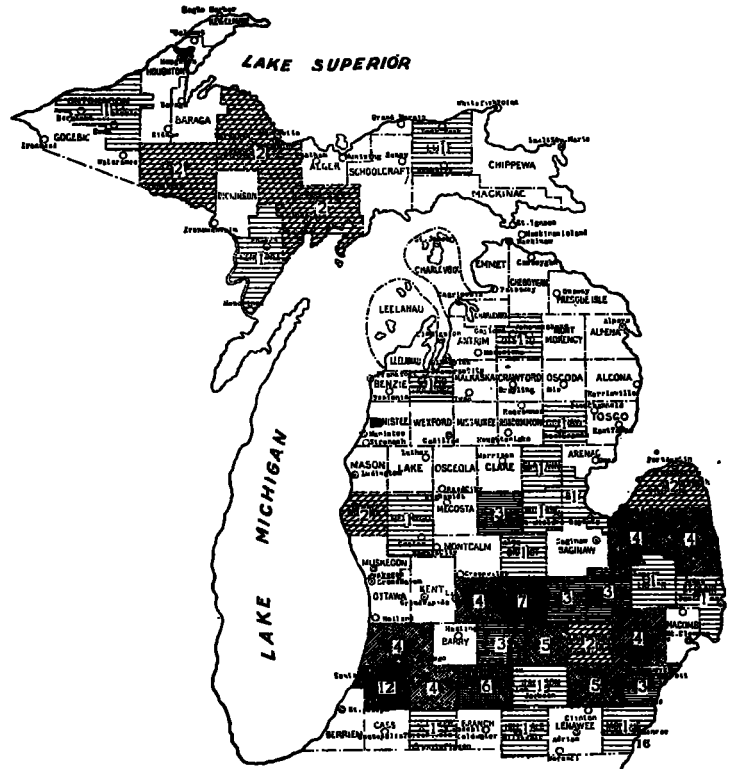


FIG. 3.—Hailstorms in June, 1920-1923, inclusive

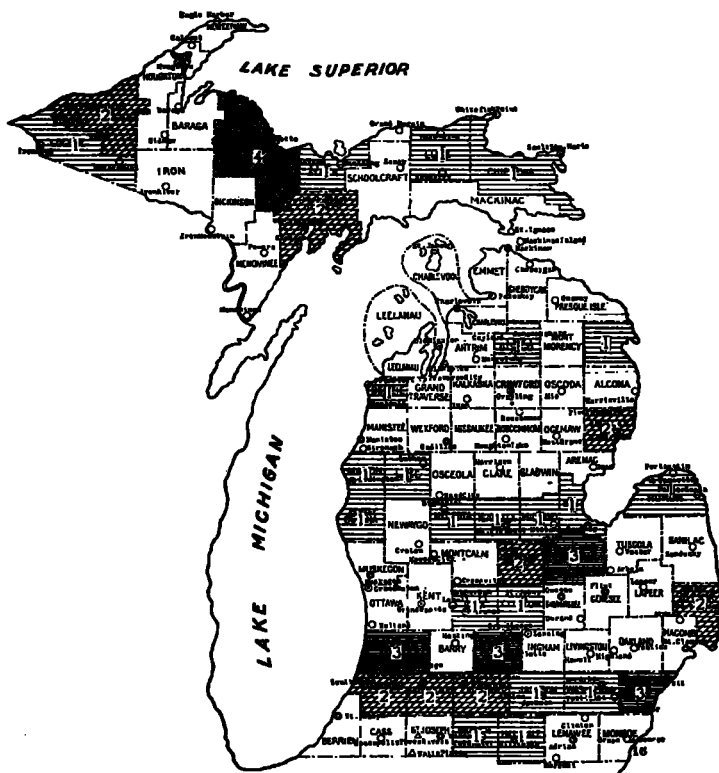


FIG. 2.—Hailstorms in May, 1920-1923, inclusive

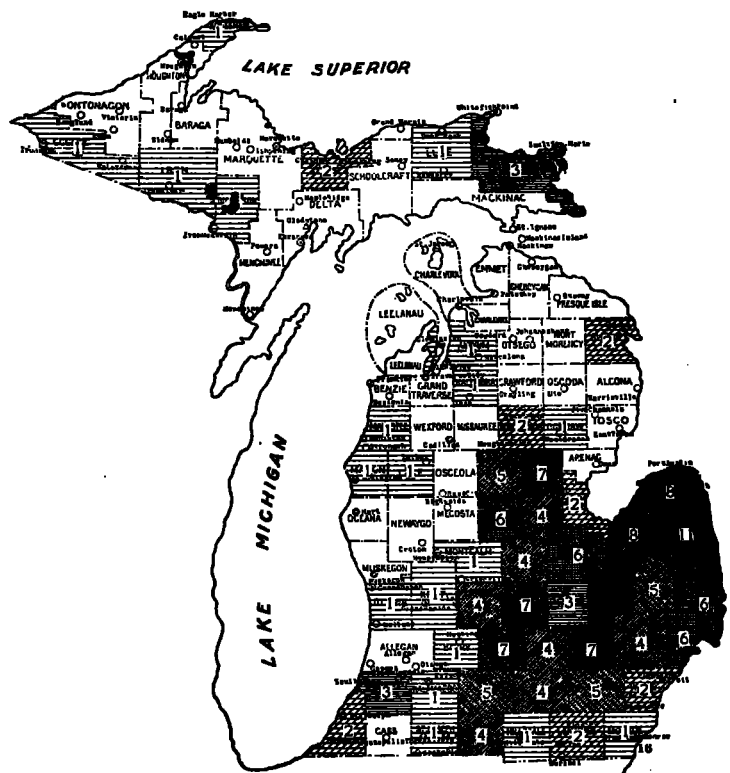


FIG. 4.—Hailstorms in July, 1920-1923, inclusive



FIG. 5.—Hailstorms in August, 1920-1923, inclusive



FIG. 7.—Hailstorms in October, 1920-1923, inclusive



FIG. 6.—Hailstorms in September, 1920-1923, inclusive

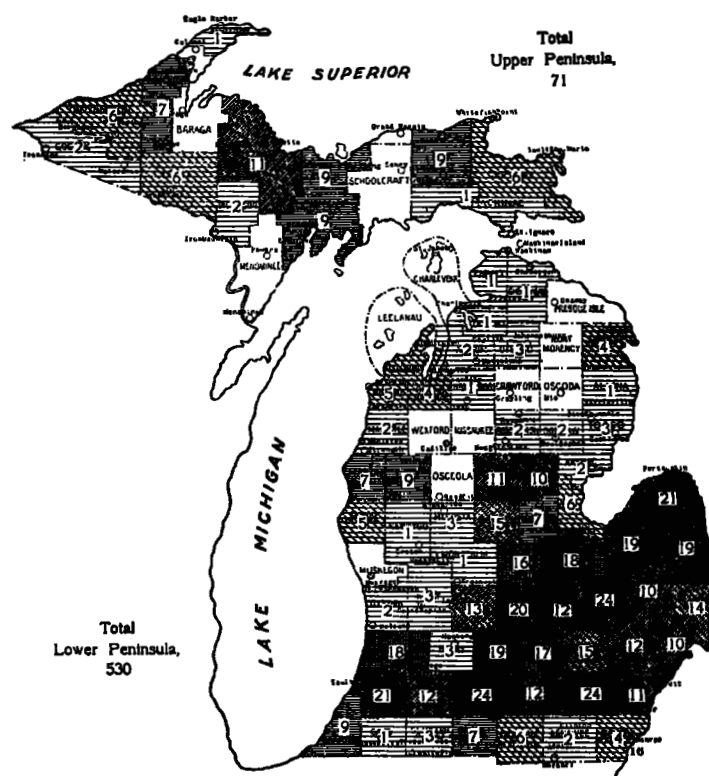


FIG. 8.—Hailstorms April to October, 1920-1923, inclusive

*May 20.*—Light hail reported near Humbolt, Marquette County.

*June 1.*—Light hail reported near Ann Arbor, Washtenaw County.

*June 6.*—Hailstorm in Almona Township, Van Buren County, with damage totaling about \$2,000. Allegan County suffered considerable damage this date, as follows: Orange Township, \$3,200; Manlius Township, \$13,500; Clyde Township, \$6,000; and Ganges Township, \$6,000.

*June 7.*—Light hail reported in Menominee, Menominee County; Marquette, Marquette County. Damage unknown.

*June 8.*—Damage in Greenbush township, Clinton County, about \$800; Marquette, Marquette County; damage not reported.

*June 9.*—Hailstorm in Geneva Township, Van Buren County; damage, \$1,800.

*June 10.*—Light hail near Ewen, Ontonagon County. Light hailstorms in Washtenaw, Oakland, Calhoun and Van Buren Counties. Damage estimated as follows:

Washtenaw County:	
Freedom Township	\$2, 200
Northfield Township	2, 000
Salem Township	850
Oakland County:	
Lyon Township	3, 300
Oakland Township	500
Calhoun County, Convis Township	250
Van Buren County, Paw Paw and Lawrence townships	500

*June 14.*—Light hail near Arbela, Tuscola County.

*June 15.*—Light hail near Port Huron, St. Clair County.

*June 16.*—Hailstorms in second tier of counties from Kalamazoo County eastward to Washtenaw. The damage by townships is estimated as follows:

Kalamazoo County, Wakesma Township	\$2, 900
Calhoun County:	
Penfield Township	2, 750
Convis Township	500
Sheridan Township	3, 000
Tekonsha Township	200
Jackson County:	
Parma Township	4, 500
Sandstone Township	5, 500
Grass Lake Township	700
Leoni Township	28, 000
Tompkins Township	1, 100
Summit Township	5, 500
Washtenaw County:	
Sharon Township	13, 500
Lodi Township	520
Freedom Township	1, 200
Northfield Township	300

Outside of this tier of counties scattered storms did damage as follows:

Gladwin, County, Sage Township	\$800
Genesee County, Thetford Township	400
Oakland County, Lyon Township	4, 000

*June 23.*—Light hail occurred at Escanaba, Delta County; Iron River, Iron County. No damage reported.

*June 27.*—Light hail reported near Iron River, Iron County.

*July 1.*—Hail reported near Iron River, Iron County.

*July 2.*—Rather light hailstorms in Genesee, Lapeer, and Sanilac Counties. Damage in Genesee County, Flint and Clayton Townships, about \$3,000; damage in Lapeer County, Lapeer and Burnside Townships, \$2,500; damage in Sanilac County, Elk Township, \$300.

*July 7.*—Damage in Clinton County, Olive Township, about \$2,000; damage in Macomb County, Washington Township, about \$1,750; damage in Ionia County, Berlin Township, about \$500; damage in Huron County, Sebawing Township, about \$600.

*July 8.*—Many hailstorms on this date, especially in the southeastern quarter of the State. The greatest damage occurred in Oakland and Lapeer Counties, but the damage was also heavy in some localities in other counties. A tabulation of estimated damages follows:

Genesee County, Fenton, Clayton, Flint Townships	\$1, 675
Livingston County, Tyrone Township	2, 000
Macomb County, Clinton Township	3, 000
Oakland County, Orion, Novi Townships	35, 000
Jackson County, Watertown, Waterloo, Leoni, Blackman Townships	4, 725
Lapeer County, Elba, Almont, Hadley, Metemora, Dryden Townships	32, 000
Saginaw County, Tittabawassee Township	1, 000
Calhoun County, Eckford, Fredonia, Morengo, Newton Townships	6, 500
Branch County, Quincy, Butler, Coldwater Townships	5, 875
Ionia County, Portland, Berlin Townships	6, 000
Eaton County, Windsor, Chester Townships	1, 200
Huron County, Paris Township	500
Washtenaw County, Sheron Township	2, 700
St. Clair County, Berlin Township	3, 600
Wayne County, Northville Township	2, 250

*July 11.*—Light storm in Antwerp Township, Van Buren County; damage about \$500.

*July 12.*—Grand Marais, Alger County; damage not reported.

*July 16.*—Considerable damage in Oakland and Wayne Counties. In Oakland County, Bloomfield and Novi Townships, the damage, mostly in latter, totaled about \$25,000. Considerable damage in Wayne County, Plymouth Township; damage about \$15,000. Slight damage also De Witt Township, Clinton County; about \$250.

*July 17.*—Hail reported at Grand Haven, Ottawa County.

*July 18.*—Damage in St. Clair County, Emmett and Berlin Townships; about \$1,900. Damage in Sanilac County, Marlette and Burnsides Townships, about \$23,500. This was mostly in Marlette Township, the following sections being affected: 1, 2, 3, 4, 5, 6, 11, 33, 34, 35, 36. Damage in Macomb County, Richmond and Armada Townships, \$16,750; damage in Midland County, Ingersoll Township, \$1,500.

*July 22.*—Slight damage, Washington Township, Macomb County; \$500.

*July 23.*—Light hailstorm at Escanaba Township, Delta County.

*July 24.*—Light hail reported near Luther, Lake County.

*July 27.*—Damage, Marlette Township, Sanilac County, about \$1,000; damage Freemont Township, Tuscola County, about \$350.

*July 28.*—Light hail occurred near Sault Ste. Marie, Chippewa County.

*July 29.*—Heavy storm in Ogemaw County, Cummings and Klacking Townships, damage probably exceeded \$25,000. Lighter damage Genesee County, Atlas and Grand Blanc Townships; about \$1,250; Lapeer County, Hadley Township, about \$850; Van Buren County, Covert Township, about \$600.

*July 30.*—Heavy hailstorm in Hamilton, Clare County, and Sage Township, Gladwin County. These two townships join each other, and the storm swept across the two from west to east. The total damage probably exceeded \$15,000, although very definite figures could not be obtained.

*August 5.*—Light storm, De Witt and Watertown Townships, Clinton County; damage about \$1,000.

*August 6.*—Hail damage occurred over many counties in the southern part of the State. Clinton County suffered a loss probably exceeding \$20,000. The heaviest damage in this county was in Dallas Township, where it probably exceeded \$7,500. Next in extent of damage

was Water Township, with about \$4,000; Lebanon, with \$3,500 or more; and the following in the order named, with decreasing amount of damage: Wacousta, Olive, De Witt, Riley, Bengal, Westphalia, Victor, and Essex.

The next county, in amount of damage, was Gratiot, where it probably exceeded \$10,000, the following townships, in the order named, suffering most: Fulton, Northshade, Bethany, and Emmerson.

The losses in Ingham County, mostly in Lansing Township, totaled about \$9,500, a slight amount of which occurred in Meridian Township.

Genesee County also suffered a loss of about \$9,500, in Mundy and Grand Blanc Townships, the damage being slightly greater in the former.

In Macomb County a loss of \$2,700 occurred, mostly in Ray and Armada Townships.

The loss in Clare County, mostly Lyon Township, was estimated at \$6,000.

In Lapeer County the damage was about \$8,500, in Almont and Goodland Townships; mostly the former.

The total damage in Branch County was about \$6,000, in Mattison, Sherwood, and Noble Townships, the amounts decreasing in the order named.

In Jackson County a total loss of about \$1,600 was divided about equally between Tompkins and Springport Townships.

The damage in Washtenaw County was about \$3,300, mostly in Pittsfield township; some also in Scio Township.

In Eaton County, Delta Township, the damage was heavy, probably exceeding \$8,000. Light damage also occurred in Eaton and Oneida Townships.

Huron County had a loss of about \$10,000, mostly in Sebewaing Township, but the damage was fairly heavy also in Fairhaven and Dwight Townships.

About \$6,500 damage resulted in Ionia County, mostly in North Plains Township, with lighter damage in Lyons Township.

In Calhoun County the total loss was probably about \$8,000 mostly in Marshall Township; also some in Fredonia and Leroy Townships. Slight damage in St. Clair County, Brockaway, not to exceed \$750.

Considerable damage in Gladwin County, Sage Township, probably exceeding \$5,000.

Saginaw County, Jonesfield Township, had a loss of about \$4,500. Also Ewen, Ontonagon County, reported hail.

*August 7.*—Damage in Fredonia and Marshall Townships, Calhoun County, about \$2,200; Pittsfield Township, Washtenaw County, \$350; Columbia Township, Jackson County, \$600.

*August 8.*—Damage, Hamilton Township, Clare County, about \$1,750; Fredonia Township, Calhoun County, about \$850.

*August 9.*—Heavy damage occurred in several southern counties, including Berrien, Hillsdale, Kalamazoo, and St. Joseph. Lighter damage in several other counties. Damage tabulated as follows:

Berrien County, Oronoca and Benton Townships, about	\$20,000-\$25,000
Kalamazoo County, Texas Townships, about	25,000-30,000
Hillsdale County, Woodbridge Township, about	25,000
Gratiot County, Elba Township, about	6,000
Ingham County, Delhi Township, about	1,000
Huron County, Verona, Lincoln, and Sigal Townships, about	2,250
Eaton County, Welton, Bellvue, Winsor, Potterville, Benton Townships, about	8,000
Saginaw County, Rockville Township	1,200
Calhoun County, Fredonia Township	1,000
St. Joseph County, Sturgis Township	6,000

*August 10.*—Storm running from southwest to northeast, starting in Washtenaw, through portions of Livingston, Oakland, Macomb and St. Clair Counties, did considerable damage as follows:

Washtenaw County, Sylvan, Lodi, Lima, Scio Township, about	\$3,000
Livingston County, Handy, Hamburg, Hartland, Putnam Townships, about	17,000
Oakland County, Commerca, Milford, Bloomfield Townships, about	9,000
Macomb County, Armada, Bruce Townships, about	2,000
St. Clair County, Mussey, Lynn, Berlin, Townships, about	4,000

*August 12.*—Macomb County, Armada and Bruce Townships, damage about \$5,000; Washtenaw County Northfield Township, about \$4,000.

*August 13.*—Oakland County, Waterford Township, damage about \$10,000; Ionia County, Boston Township, about \$750; Genesee County, Clayton, Gaines, Mundy, Townships, \$1,250; Eaton County, Bellevue Township, about \$600.

*August 14.*—Washtenaw County, Dexter and Sylvan Townships, damage \$1,250.

*August 15.*—Ontonagon County, Victoria Township, damage not reported; Marquette County, Ishpeming Township, damage not reported; Luce County, Newberry Township, damage not reported.

*August 18.*—Washtenaw County, Webster Township, about \$400.

*August 19.*—Berrien County, Creneka Township, damage, \$4,000.

*August 20.*—Washtenaw County, Sylvan Township, damage, \$650.

*August 27.*—Clinton County.—Riley township, damage, \$300.

*August 28.*—Shiawassee County, Burns Township, damage, \$1,000.; Livingston County, Howell Township, \$1,600.

*September 6.*—Allegan County, Otsego Township, damage not reported; Lake County, Luther Township, damage not reported.

*September 11.*—Huron County, Paris township, damage, about \$3,500; Huron County, Bigham Township, damage about \$500; Mecosta County, Sheridan Township, damage about \$1,750.

*September 12.*—Clare County, Franklin Township, damage about \$5,000.

*September 26.*—Saginaw County, Bloomfield Township, damage about \$1,800; Huron County, Grand Township, damage about \$500.

*September 28.*—Marquette County, Marquette Township, damage not reported.

*September 29.*—Alger County, Munising Township, damage not reported; Allegan County, Allegan Township, damage not reported.

*October 5.*—Huron County, Colfax Township, damage about \$2,500.

*October 10.*—Mason County, Ludington Township, damage unknown.

*October 11.*—Gratiot County, Alma Township, damage not reported; Tuscola County, Arbela Township, damage not reported.

*October 13.*—Houghton County, Houghton Township.

*October 28.*—Alger County, Munising Township.

#### HAILSTORMS IN MICHIGAN, YEAR 1921.

*April 9.*—Hail was reported in Gratiot County, near Alma; damage not reported.

*April 16.*—Hailstorms occurred in Allegan County, near Plainwell and Allegan; also in St. Clair County, near Port Huron; Tuscola County, near Arbella.



*April 21.*—Light hail was reported in Tuscola County, near Arbella; in Genesee County, Thetford and Forest Townships, damage slight, total estimated at \$250; Tuscola County, Millington Township, slight damage; Saginaw County, Chesaning and Maple Grove Townships, considerable damage; total in county about \$6,750.

*April 25.*—Light hailstorms occurred in Allegan County, near Allegan and Plainwell, and in Houghton County, near Houghton.

*April 28.*—Light fall of hail in Gratiot County, near Alma.

*April 30.*—A hailstorm occurred in Marquette County, Ishpeming.

*May 3.*—Hail was reported in Chippewa County, near Sault Ste. Marie.

*May 13.*—Hailstorms occurred in Wayne County, near Detroit, and Luce County, near Newberry.

*May 21.*—Light hail reported in Eaton County, with about \$250 damage in Sunfield Township; also in Marquette County, near Humboldt.

*May 22.*—Hailstorms occurred in Alpena County, near Alpena; Iosco County, near East Tawas; in Ontonagon County, near Victoria, and in Delta County, near Escanaba.

*May 23.*—Falls of hail occurred in Allegan County near Allegan, Otsego, and Plainwell; in Saginaw County, near Saginaw; in St. Clair County, near Port Huron, and Iosco County, near East Tawas.

*May 24.*—Hailstorms occurred in Calhoun, Eaton, Bay, and Saginaw Counties. Damages in Calhoun County, Sheridan Township, about \$1,000; Bay County, Frankenmuth Township, estimated damage \$2,000; and in Kochville Township, Saginaw County, total damage about \$400.

*May 25.*—Hailstorms occurred in Saginaw County, near Saginaw; Washtenaw County, near Ann Arbor; Kalamazoo County, near Kalamazoo.

*May 27.*—Heavy hailstorms in Ionia County, especially in North Plains and Sebewa Townships, with estimated losses of \$16,500. Hail was heavy also in Sunfield Township, Eaton County, with estimated damage of \$3,300. In Branch County, near Coldwater, hail caused damages estimated at \$1,250. In Columbia Township Jackson County, the damage was about \$775.

*May 28.*—Light hailstorms were reported in Wayne County, near Detroit; in St. Clair County, near Port Huron.

*May 30.*—Hail was reported in Delta County, near Escanaba.

*June 3.*—Light hail was reported in Allegan County, near Ganges.

*June 5.*—Light hailstorm, Denmark Township, Tuscola County.

*June 18.*—Hailstorm in Mayfield Township, Lapeer County, with estimated damage of \$3,500. In Flint and Clayton Townships, Genesee County, the damage from hail on this date was estimated at \$5,300; also in Marquette County, near Ishpeming.

*June 20.*—Slight damage in Ingham and Van Buren Counties, probably not to exceed \$1,250.

*June 21.*—Damage in Coe Township, Isabella County, about \$2,500; in Jasper Township, Midland County, about \$4,250; in Homer Township, Calhoun County, about \$1,000; near Detroit, Wayne County, unknown.

*June 25.*—Damage in Saline Township, Washtenaw County, about \$350; in Adams Township, Hillsdale County, about \$7,500; in Paw Paw Township, Van Buren County, about \$6,500; in Bangor Township, Van Buren County, about \$7,250.

*June 26.*—In Windsor Township, Eaton County, damage estimated at \$2,825 occurred. In Benton Township, Eaton County, the damage was about \$800. In Ingham County, Delhi Township, estimated damage \$4,350; in Van Buren County, Antwerp and Paw Paw Townships, the damage was nearly \$8,000; in Texas Township, Kalamazoo County, the damage was estimated at \$7,000.

*July 2.*—Slight damage in Texas Township, Kalamazoo County.

*July 4.*—Heavy hailstorms in Eaton Township, Eaton County, damages about \$6,000, and in Eaton Rapids Township, Eaton County, about \$1,000.

*July 5.*—Several severe hailstorms this date. Greatest damage occurred in Genesee County, city of Flint, estimated at \$50,000, by the postmaster, Flint, Mich. The width of path of this storm was estimated as 4 miles. The hailstones were one-fourth to one-half inch in diameter. The storm occurred about 4 p. m., and came from the northwest. Outside of Genesee County the next greatest damage on this date was in Paw Paw Township, Van Buren County, estimated at \$18,500. In Bloomfield Township, Saginaw County, the damage totaled about \$14,000; Meridian Township, Ingham County, suffered about \$2,500 from a hailstorm; Crystal Township, Montcalm County, about \$2,000; Hartland Township, Livingston County, about \$1,000, while lesser damage occurred in sections of Huron and Calhoun Counties, respectively, about \$700 and \$200. Also in Kent County, near Grand Rapids, damage slight.

*July 6.*—On this date there were many and scattered hailstorms. The total damage was considerable, but the loss was not great in any one section. The damages might be tabulated as follows:

Gratiot County, Seville and Arcola Townships, about.....	\$2, 000
Sanilac County, Maple Valley Township, about.....	670
Huron County, Sebawaing Township, about.....	4, 750
Lapeer County, Goodland and Dryden Townships, about..	1, 250
Saginaw County, Frankenmuth and Birch Run Townships, about.....	2, 750
Oakland County, White Oak and Highland Townships, about.....	3, 300
Eaton County, Eaton and Brookfield Townships, about....	1, 200

Also in Luce County, near Newberry, damage not reported.

*July 7.*—Heavy hailstorm in Mason County, Sheridan, Sherman, Branch, and Freesoil Townships. "Hailstones size of walnuts; some nearly as large as small hen's egg." Width of path about 2 miles. Total damage must have been more than \$25,000. Light hailstorm also near Eaton Rapids, this date; also in Alger County, near Munising.

*July 8.*—Severe hailstorm in Sunfield and Roxand Townships, Eaton County. Over \$50,000 damages estimated in these two townships. The damage was fully as great or even greater also in Woodland Township, Barry County, the three townships lying in a row running east and west. The storm was evidently about 3 miles in width, the path of greatest destruction being about 12 miles long. No report available as to size of hailstones.

In addition to the storm mentioned, damage from hail occurred in several other counties on this date, as follows:

Gratiot County, Bethany Township, about.....	\$1, 500
Saginaw County, Bloomfield Township, about.....	800
Genesee County, Clayton Township, about.....	4, 500
Gladwin County:	
Second Township, about.....	1, 600
Gladwin and Grout Townships, about.....	1, 900
Clare County, Hamilton and Arthur Townships, about..	13, 500
Sanilac County, Minden Township, about.....	900
Isabella County, Nottawa Township, about.....	4, 250

*July 9.*—Tuscola County, Gilford Township, damage about \$700.

*July 10.*—Sanilac County, Lexington Township, damage about \$650.

*July 13.*—Isabella County, about \$7,500, heaviest in Nottawa Township; lighter in Fremont, Rolland, Deerfield, Bloomfield, and Isabella Townships. Also in Chippewa County, near Sault Ste. Marie.

*July 14.*—Scattered hailstorms in the central portion of the State; estimated damage as follows:

Eaton County, Eaton Rapids Township.....	\$4,500
Isabella County, Nottawa, Fremont, Bloomfield Townships.....	3,800
Branch County, Algonsee Township.....	600
Washtenaw County, Bridgewater Township.....	650
Livingston County, Putnam Township.....	3,350
Monroe County, Raisinville Township.....	1,500

*July 15.*—Isabella County, Vernon Township, damage about \$400. On this date very heavy and destructive hailstorm occurred in the northwestern portion of Saginaw County, in Jonesfield, Richland, Lakefield, and Fremont Townships. The postmaster at Merrill, in Jonesfield Township, reports that the storm was about 3 miles in width and 10 miles in length, extending from north to south. Hailstones were one-half inch in diameter, killing chickens, breaking windows, and destroying farm crops. The storm occurred at about 12:30 p. m. The damage in the vicinity of Merrill he estimates at \$60,000 to \$75,000. The total damage of the entire storm probably exceeded \$100,000 in Saginaw County, while farther north, in Mount Holey and Ingersoll Townships, Midland County, the damage was estimated at \$68,500. Lighter storms on the same date occurred in Shiawassee County, Rush Township, damage about \$5,000; Sage Township, Gladwin County, about \$8,000, and light damage also in Marion Township, Sanilac County.

*July 18.*—Hailstorm in Webster Township, Washtenaw County; damage about \$1,500.

*July 26.*—Hailstorm in Bloomfield and Sigel Townships, Huron County, with total estimated damage of \$3,000. Very light damage reported this date also in Isabella, Clinton, and Sanilac Counties, with damage estimated at from \$200 to \$650 in individual counties.

*July 29.*—Widespread hailstorms on this date. Most destructive in Tuscola and St. Clair Counties. In Tuscola County the greatest damage occurred in Denmark, Junista, and Gifford Townships, probably exceeding \$15,000 in each township. In St. Clair County the greatest damage was in Casco Township, where the damage was nearly \$50,000. Damage elsewhere in the county was estimated as follows: Mussey Township, \$3,350; Lynn Township, \$3,000; China Township, \$2,000; Cottleville Township, \$1,500; Emmett Township, \$2,800; Berlin Township, \$1,000; Riley Township, \$2,000; Ira Township, \$3,600; and Wales Township, \$5,250. On the same date, in New Haven Township, Shiawassee County, the damage from hail was about \$4,000. In Long Rapids Township, Alpena County, estimated damage \$1,500. Slight damage in Clayton and Flushing Townships, Genesee County, probably not exceeding \$600. In Burlington Township, Lapeer County, damage about \$5,275. Hamilton Township, Clare County, about \$6,200; Sage Township, Gladwin County, about \$1,350; Lincoln Township, Berrien County, about \$16,500; Merritt Township, Bay County, about \$1,600. In Richmond Township, Macomb County, the storm was described as "very severe," path about 3½ miles wide; total damage about \$9,000.

*July 30.*—Another date with heavy hailstorms, probably doing more than \$100,000 damage in the State as a

whole. The county suffering the greatest damage was Clare (Hamilton and Arthur Townships), where the damage was estimated \$47,300. Berrien County had a loss of about \$25,000 in Royalton and Lake Townships, mostly in the former. The loss in Genesee aggregated about \$10,000, in Mundy, Gaines, Flushing, Clayton, and Flint Townships. The loss in St. Clair County, Casco, China, and Columbus Townships, totaled nearly \$6,000; while in Gladwin County, Sage, Gladwin, Buckeye, and Lutman Townships, the damage probably exceeded \$11,000. In Midland County damage to the extent of \$5,250 occurred; also in Calhoun and Livingston Counties this date, probably not exceeding \$750 in either county; also in Chippewa County, near Whitfish Point.

*July 31.*—Light hail in Gladwin County, Nester Township, damage about \$750, and Calhoun County, Lee Township, about \$200.

*August 5.*—Light hail occurred in Houghton County, near Houghton.

*August 6.*—Destructive hailstorm 4 miles north of Port Huron. Stones as large as golf balls. Path about 2 miles long and 2 miles wide, total damage estimated at \$25,000; Lapeer County, Townships of Imlay, Elba, Hadley, and Lapeer, damage about \$2,500.

*August 13.*—Moderately heavy hail in Lexington Township, Sanilac County, with damage estimated at \$5,000, lighter damage in same county, Elk and Buel Townships, not over \$1,600 damage in two. Light storms in Macomb, Ingham, Tuscola, and Shiawassee Counties, the damages in all probably being less than \$5,000.

*August 17.*—Destructive hailstorms in several counties. Greatest damage in Barry County, Woodland Township, and lighter in Castleton and Barry Townships, with total for county near \$50,000. In Eaton County the damage was about \$17,500, with greatest damage, in order, in townships of Roxand, Oneida, and Sunfield. Washtenaw County suffered a loss of about \$16,000, mostly in Webster, Scio, Northfield, and Lima Townships and lighter damage in Dexter, Ann Arbor, Pittsfield, and Sylvan Townships.

*August 18.*—Hail damage in Woodland Township, Barry County, about \$5,000.

*August 29.*—Slight damage in Clare and Gladwin Counties, about \$500 each.

*August 30.*—Hail damage in Clare County about \$25,000. About \$17,500 of this was in Hamilton Township. Shiawassee County damage about \$1,500, in New Haven and Caledonia Townships, mostly the former.

*September 4.*—Light hail occurred in Lake County, near Luther.

*September 20.*—Hailstorms reported in Houghton County, near Houghton.

*September 29.*—Hail was reported in Iron County, near Iron River; also in Union Township, Isabella County, damage about \$7,500.

*September 30.*—Light hailstorm in Grand Traverse County, near Fife Lake; Benzie County, near Benzonia; Branch County, near Coldwater; and in Alger County, near Munising.

*October 2.*—Light hail reported in Delta County, near Escanaba.

*October 3.*—Hailstorms occurred in Allegan County, near Otsego, Trowbridge, and Allegan; in Calhoun County, near Albion; Jackson County, near Jackson; Saginaw County, near Saginaw; Lake County, near Luther; Berrien County, near St. Joseph; Gratiot County, near Alma; Mason County, near Ludington; Shiawassee County, near Durand.

*October 4.*—Hailstorm was reported in Berrien County, near St. Joseph; also in Mason County, near Ludington.

*October 7.*—Hailstorms were reported in Mason County, near Ludington; Benzie County, near Frankfort; in Ontonagon County, near Victoria; and in Allegan County, near Munising.

*October 8.*—There were falls of hail over Berrien County, near St. Joseph; Washtenaw County, near Ann Arbor; Calhoun County near Battle Creek; Huron County, near Harbor Beach; Mason County, near Ludington.

*October 12.*—Hailstorms were reported in Antrim County, near Old Mission; Calhoun County, near Albion; and Allegan County, near Plainwell and Otsego.

*October 17.*—A hailstorm was reported in Ottawa County, near Grand Haven.

*October 22.*—Light hail fell in Allegan County.

#### HAILSTORMS IN MICHIGAN, 1922

*April 3.*—Fine hail fell several times near Newberry, Luce County; no damage reported.

*April 7.*—Hail fell near Sault Ste. Marie, Chippewa County; there was no damage. Also near Omer, Alger County.

*April 10.*—Hail fell near Plainwell, Allegan County; no damage.

*April 11.*—Hail was reported near Alma, Gratiot County; Bay City, Bay County; Big Rapids, Mecosta County; Newberry, Luce County. There was no damage as nothing had started to grow.

*April 16.*—Hail fell near Wellston, Manistee County; no damage.

*April 17.*—Falls of hail were reported near Alma, Gratiot County; Lansing, Ingham, Newberry, Luce County; and near Harbor Beach, in Huron County. At the latter locality the hail was very large, but the damage was nothing, as there were no growing things started.

*April 19.*—Hail was reported near Otsego, Allegan County, and also near Plainwell in the same county.

*May 4.*—Hail fell at Ludington, Mason County, without damage.

*May 6.*—Hart, Oceana County, also in Huron County, near Uby were visited by hailstorms; damage about \$1,825.

*May 16.*—Bloomington, Van Buren County; also Ironwood, Gogebic County, had falls of hail; there was no damage reported.

*May 17.*—Victoria, Ontonagon County; no damage.

*May 18.*—Light hail at Battle Creek, Calhoun County, and at Plainwell, Allegan County; no damage.

*May 24.*—Clinton County, near St. Johns and Fowler; damage \$3,500.

*June 5.*—Severe hailstorms visited an area bounded by Ionia Shiawassee, Oakland, Livingston, and Ingham Counties, with damage estimated as follows:

Shiawassee, near Shaftsbury	\$6,000
Oakland, near Milford	1,200
Ingham, near Haslett and Lansing	1,200
Ionia, near Ionia, Lake Odessa, and Portland	9,500
Livingston, near Fowlerville	2,500

*June 8.*—Light fall of hail reported from Wayne County, near Eloise.

*June 9.*—Moderate to heavy falls of hail fell quite generally from Van Buren County northeastward through Huron County, with damage estimated as follows:

Huron County, near Harbor Beach, damage unknown.	
Allegan County, near Fennville and Allegan	\$2,900
Eaton County, near Eaton rapids	12,270
Van Buren County, near Paw Paw	500

Ingham County, near Mason	5,500
Calhoun County, near Athens and Ceresco	300
Livingston County, near Fowlerville	300
Genesee County, near Flint and Flushing	5,500
Sanilac County, near Minden City	450
Allegan County, near Allegan, damage unknown.	

*June 10.*—Shiawassee County, near Durand; damage unknown.

*June 11.*—Bay county, near Bay City; damage unknown.

*June 16.*—Severe and even violent thundersqualls accompanied by damaging falls of hail and with heavy downpours occurred from the southwestern corner of the State northeastward through Ogemaw and Sanilac Counties. The damage reported was as follows:

Ionia County, near Pewamo and Lyons	\$7,800
Shiawassee County, near Shaftsbury, Henderson, and New Lathrop	7,000
Clinton County, near St. Johns, Westphalia, Eagle, Fowler Elsie, and Merle Beach	3,000
Calhoun County, near Athens, Homer and Tekonsha	2,000
Lenawee County, near Morenci, cloudburst and fall of hail.	
St. Joseph County, near Golen and Sturgis	9,000
Ionia County, near Webber Dam, damage unknown.	
Sanilac County, near Sandusky	2,750
Manistee County, near Wellston, damage unknown.	
Ogemaw County, near West Branch	13,000
Van Buren County, near Hartford, Lawrence and Decatur	4,500

*June 17.*—Falls of hail were reported in Newaygo County, near Croton, and in Oceana County, near Hart; damage unknown.

*June 27.*—Light to moderate falls of hail occurred over the central portion of the Lower Peninsula, with damage as follows:

Eaton County, near Eaton Rapids and Charlotte	\$1,400
Calhoun County, near Battle Creek	200
Gratiot County, near St. Louis	4,000
Isabella County, near Shepard	2,000
Ingham County, near Mason	7,150
Van Buren County (territory unknown)	1,500

*June 28.*—There was a heavy fall of hail in Van Buren County, near Lawton and Paw Paw, damage \$9,150.

*June 30.*—Hail fell heavily in Sanilac County, near Sandusky and Deckerville, the damage being estimated at \$25,000. A moderate fall in Clinton county, near Elsie, damage \$1,700.

*July 3.*—A heavy hailstorm occurred in Jackson county near Jackson, the damage being estimated at \$12,000.

*July 7.*—A light fall in Ingham, near Williamston, damage \$700.

*July 8.*—Light falls of hail; in Tuscola county, near Vassar, the damage being reckoned as \$360; Sanilac County, near Crosswell, \$340.

*July 9.*—A fall of hail occurred in Gogebic County, near Ironwood. No estimation of damage is known.

*July 10.*—Light falls of hail were reported as follows: Sanilac county, near Sandusky, damage \$630; Genesee County, in Grand Blanc Township, \$250.

*July 15.*—A thunderstorm accompanied by hail was reported in Keweenaw County, near Eagle Harbor; damage unknown.

*July 16.*—Light to heavy fall of hail in Manistee County, damage unknown; also on the same date as follows:

Eaton County, near Dimondale, in Windsor Township	\$425
Clinton County, near Dewitt	704
Oceana County, in Elbridge Township	24,050

*July 18.*—In Kalkaska County, near Ivan; damage not reported.

*July 31.*—Severe disturbances accompanied by lightning, very large hail, and winds of almost cyclonic force obtained over the southern counties of the lower penin-



sula. In Lenawee County, near Morenci and Adrian, hail as large or larger than hens' eggs fell, doing heavy damage. In many counties the loss in crops was serious. A tornado occurred near Rollin. The damage was estimated as follows:

St. Clair County, Marine City and St. Clair.....	\$1,600
Clinton County, near St. Johns, Merle Beach, Bath, and Fowle.....	15,000
Genesee County, near Davidson.....	2,400
Jackson County, near Rives Junction and Grass Lake.....	19,000
Washtenaw County, near Manchester, Ann Arbor, and Saline.....	6,500
Lenawee County, near Adrian.....	20,000
Saginaw County, near Hemlock.....	600
Shiawassee County, near Owosso.....	6,500
Wayne County, near Detroit, damage not reported.	

August 2.—Moderate falls of hail, with damage as follows:

Clare County, near Clare.....	\$3,000
Clinton County, near St. Johns.....	400
Ingham County, near Lansing.....	1,000
Wayne County, near Detroit, damage unknown.	
Delta County, near Escanaba, damage unknown.	

August 3.—Light to heavy fall of hail occurred over the central counties of the southern lower peninsula, with damage as follows:

Ingham County, near Lansing.....	\$7,500
Arenac County, near Turner.....	22,500
Oakland County, near Ocford.....	3,000
Livingston County, near Rushton.....	10,000
Clinton County, near St. Johns, Dewitt, and Merle Beach.....	4,800
Washtenaw County, near Whitmore Lake.....	300
Isabella County, near Rosebush.....	375
Eaton County, near Vermontville.....	110
Calhoun County, near Albion.....	180

Near Albion it hailed for 30 minutes, with stones as large as one-half inch in diameter. Three different storms passed over during the afternoon. Ingham County, near Lansing, hail was reported but damage unknown.

August 7.—Moderate and heavy falls of hail; damage estimated:

Lapeer County, near Clifford.....	\$3,500
Tuscola County, near Reese and Mayville.....	9,200
Sanilac County, near Marlette and Lexington.....	10,000
Midland County, near Midland.....	22,500
Saginaw County, near Saginaw and Hemlock.....	1,000
Calhoun County, near Albion.....	250
Washtenaw County, near Ann Arbor.....	1,200
Jackson County, near Jackson.....	7,500
Livingston County, near Rushton.....	1,000

August 17.—Luce County, near Newberry; considerable hail fell the size of large hazelnuts from 4 to 4:15 p. m.; damage unknown.

August 24.—Grand Traverse County, near Fife Lake; damage unknown.

September 1.—Light to very heavy and damaging falls of hail; the extreme south central part of the lower peninsula was visited.

Genesee County, near Clio and Mount Rose.....	\$250
Jackson County, near Springport.....	5,500
Eaton County, near Eaton Rapids.....	820
Calhoun County, near Albion.....	2,000
Hillsdale County, near Osseo.....	750
Ingham County, near Leslie and Mason.....	4,500
Cass County, near Marcellus.....	6,000
Van Buren County, near Mattawan, Paw Paw, Bangor, and Decatur.....	97,200

September 2.—Wayne County, near Detroit; no damage estimate. Van Buren County, near South Haven; no damage estimate.

September 6.—Sanilac County, Sandusky; damage, \$250.

September 7.—Livingston County, near Howell; damage, \$3,000.

September 8.—Oceana County, near Hart; no damage.

September 9.—St. Clair County, near Port Huron; light fall of hail without loss.

October 12.—Bay County, near Bay City; damage slight.

October 23.—Saginaw County, Saginaw; damage slight.

#### HAILSTORMS IN MICHIGAN, 1923

April 21.—Light hail fell near Alma, in Gratiot County, and Albion, in Calhoun County; at the latter place the time was from 2:10 p. m. to 2:25 p. m. There was no damage to crops, as nothing had been planted because of the backward season.

May 10.—Light hail fell near Saranac, Ionia County; no damage reported.

May 12.—There was a hailstorm near Saranac, in Ionia County; no damage reported.

May 19.—Falls of hail occurred at Otsego, Plainwell, and Trowbridge, in Allegan County; no estimate of damage was given. Heavy falls of hail visited several other counties, with damage as follows:

Gratiot County, in Pine River Township.....	\$500
Midland County, in Jasper Township.....	2,500
Isabella County, in Coe Township.....	5,250

May 20.—Light hail fell near Saranac, Ionia County; also near Big Rapids, Mecosta County; no damage reported.

June 2.—Light falls of hail fell in Dwight and Lincoln Townships, Huron County, with damage estimated at \$670.

June 5.—There were light hailstorms in Bengal Township, Clinton County; damage about \$40. Also near Ann Arbor, in Ann Arbor Township, Washtenaw County.

June 6.—Moderate and heavy hailstorms occurred in two counties: Texas Township, in Kalamazoo County; damage \$1,000; Raisinville, in Monroe County, damage \$8,750.

June 7.—A serious hailstorm swept over Texas Township, Kalamazoo County, damage \$8,550; Antwerp Township, in Van Buren County, \$750.

June 13.—Very light hailstorm in Westphalia Township, Clinton County; damage \$60.

June 14.—Light to moderate falls of hail occurred as follows: Broomfield Township, Isabella County, damage \$575; Novi Township, Oakland County, \$3,300.

June 20.—Light hailstorm in Watertown, Tuscola County, with damage estimated at \$100.

June 21.—Light fall of hail near Fife Lake, in Homes Township, Grand Traverse County; no damage reported. In Gilford Township, Tuscola County, damage \$900; Dewitt and Olive Townships, Clinton County, \$400. Light falls of hail also occurred near Alpha.

June 22.—Severe hailstorm swept Ionia County, with damage estimated as follows: Berlin Township, \$9,408; Sylvan Township, \$5,400.

June 23.—Moderate falls of hail fell over Ionia County, Sebawa Township, damage, \$300; Campbell Township, \$1,224.

June 30.—Near Newberry, in Pentland Township, Luce County, hailstones from one-quarter to three-quarters of an inch in diameter fell and remained on the ground for several hours. There was little apparent damage to crops.

*July 2.*—Light to serious hailstorms occurred from the southwest counties northeastward to Lake Huron, with damage estimated as follows:

Frazer Township, Bay County.....	\$1, 650
Garfield Township, Bay County.....	2, 046
Piconning Township, Bay County.....	825
Ingersol Township, Midland County.....	750
Paris Township, Huron County.....	37, 890
Bingham Township, Huron County.....	170
Bloomfield Township, Huron County.....	700
Chandler Township, Huron County.....	100
Verona and Meade Townships, Huron County.....	925
Union Township, Branch County.....	12, 600
Waterford and Bloomfield Townships, Oakland County.....	4, 356
White Lake Township, Oakland County.....	330
Avon Township, Oakland County.....	1, 485
Denmark Township, Oakland County.....	24, 200
Wheatland, Argyle, Custer, Lamotte, and Marlette Townships, Sanilac County.....	2, 130
Rives Township, Jackson County.....	210
Leslie Township, Ingham County.....	325
Odesa Township, Ionia County.....	2, 340
Burlington Township, Calhoun County.....	581
Grand Blanc Township, Genesee County.....	50
Fenton Township, Genesee County.....	369
Northfield Township, Livingston County.....	825

*July 3.*—Falls of hail were reported near Harrisville, in Harrisville Township, Alcona County, and Iron Mountain, in Breitung Township, Dickinson County; the damage was not given. Light hailstorms were also reported in two other counties, with damage estimated as follows:

Grout Township, Gladwin County.....	\$480
Paris Township, Huron County.....	1, 260
Bingham Township, Huron County.....	150

*July 5.*—Light to moderate visitations of hailstorms occurred, with estimated damage as follows:

Genesee Township, Genesee County.....	\$50
Denmark Township, Genesee County.....	100
Lincoln Township, Isabella County.....	5, 250

Severe hailstorm swept over Clinton County; estimated damage, Bengal Township, Clinton County, \$10,080.

*July 6.*—Light falls of hail over two counties; damage estimated:

Clayton Township, Shiawassee County.....	\$400. 00
Fawn River Township, St. Joseph County.....	400. 00
Munday and Gaines Townships, Genesee County.....	252. 50
Clayton Township, Genesee County.....	225. 00
Leslie Township, Ingham County.....	260. 00

*July 7.*—Light hailstorms occurred over Genesee County; damage, Munday and Gaines Townships, Genesee County, \$675.

*July 9.*—Light hailstorm over one county, with damage estimated, Northfield Township, Livingston County, \$825.

*July 10.*—Moderate to severe hailstorms, with tracks sweeping eastward or northeastward in the central portion of the southern counties, with damage estimated as follows:

Sebewa and Danby Townships, Ionia County.....	\$3, 180
Keene Townships, Ionia County.....	180
Riley and Westphalia Townships, Ionia County.....	4, 880
Bengal Township, Ionia County.....	300
Northfield Township, Ionia County.....	12, 670
Green Oak Township, Ionia County.....	640

*July 11.*—A fall of hail was reported near Alma, in Arcada Township, Gartiot County; damage and intensity slight.

*July 14.*—Light to moderate fall of hail occurred over four counties; the paths moved northeastward; damage estimated:

Hayes Township, Clare County.....	\$3, 050
Macomb Township, Clare County.....	1, 020
Quincy Township, Branch County.....	420
Allan Township, Hillsdale County.....	500

*July 29.*—Hail was reported near Escanaba in Ford Township, Delta County; the damage was negligible.

*July 30.*—A local hailstorm occurred near and in Alpena, in Sanborn Township, Alpena County, from 12:41 p. m. to 12:50 p. m., with stones measuring from a quarter to three-eighths of an inch in diameter; the damage was small and over a little area.

*August 7.*—A severe hailstorm swept over Washtenaw County:

Lima Township, Washtenaw County.....	\$5, 200
Lyndon Township, Washtenaw County.....	4, 000
Sylvan Township, Washtenaw County.....	2, 000

*August 18.*—The severest hailstorm of the year occurred over the east-central portion of the lower peninsula, the paths of the various disturbances traveling northeastward; damage as follows:

Coe and Chippewa Townships, Isabella County.....	\$10, 812
Lincoln Township, Isabella County.....	50, 031
Fremont and Deerfield Townships, Isabella County.....	20, 744
Deerfield and Broomfield Townships, Isabella County.....	1, 625
Lake Township, Isabella County.....	1, 500
Paris Township, Isabella County.....	1, 900
Hume and Meade Townships, Isabella County.....	27, 475

The disturbances over the following counties were much lighter:

Orange Township, Ionia County.....	\$2, 100
Forester Township, Sanilac County.....	350
Maple Valley, Sanilac County.....	100
Marion Township, Sanilac County.....	320
Munday and Gaines Townships, Genesee County.....	50

*August 27.*—A light hailstorm occurred near Allegan, in Allegan Township, Allegan County; damage not estimated. Also in Lincoln Township, Isabella County, \$2,875.

*August 28.*—A moderate fall of hail visited one county; damage, Wakeshma Township, Kalamazoo County, \$3,400.

*August 29.*—Light to moderate hailstorms, with estimated damage:

Athens Township, Calhoun County.....	1, 883
Newton Township, Calhoun County.....	574
Burns Township, Shiawassee County.....	400
Wakeshma Township, Kalamazoo County.....	2, 480
Argentine Township, Genesee County.....	125
Genesee Township, Genesee County.....	65
Nove Township, Oakland County.....	10, 230
Bedford Township, Monroe County.....	2, 500
LaSalle Township, Monroe County.....	700
Ida and LaSalle Townships, Monroe County.....	1, 310
Ida and Bedford Townships, Monroe County.....	1, 500
Bedford Township, Monroe County.....	3, 450
Ida Township, Monroe County.....	14, 465
Erie Township, Monroe County.....	2, 250
Attica and Lapeer Townships, Lapeer County.....	900
Lake Township, Huron County.....	500

In Monroe County the damage was severe. The tracks moved northeastward or eastward.

*September 1.*—A light hailstorm visited Conway Township, Livingston County, with an estimated damage of \$693.

*September 12.*—Hailstorms were quite prevalent over the upper peninsula and northern counties of the lower peninsula, but either crops were out of danger or the damage was very light. No damage was reported in any cases on this date. The localities were as follows: Near Deer Park, in McMillan Township, Luce County; near Hart Township, Oceana County, also Charlevoix County; near Grand Marais, in Burt Township, Alger County; Humboldt, in Humboldt Township, Marquette County; near Iron River, in Iron River Township, Iron County; near Munising, in Munising Township, Alger County; near Powers, in Spaulding Township, Menominee County; near Sidnaw, in Duncan Town-

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ship, Houghton County; near St. Ignace, in Moran Township, Mackinac County; near St. James, in St. James Township, Charlevoix County; near Escanaba, in Escanaba Township, Delta County; near Houghton, in Houghton Township, Houghton County. No damage reported at any of these places.

*September 13.*—Hail occurred near Alpena, in Sanborn Township, Alpena County; near Benzonia, in Benzonia Township, Benzie County; near Frankfort, in Frankfort Township; near Munising, in Munising Township, Alger County; damage not reported. In Old Mission, Grand Traverse county; Sheridan Township, Huron County, damage \$450.

*September 14.*—Hail was reported near Omer, in Arenac Township, Arenac County.

551. 578. 7 (763)

#### HEAVY HAILSTORM AND LOCAL SQUALL AT NEW ORLEANS, LA., WITH A SUMMARY OF THE PREVIOUS RECORDS OF HAIL

By R. A. DYKE, Meteorologist

[Weather Bureau Office, New Orleans, La., April 20, 1924]

A thunderstorm passed over New Orleans, La., on April 17, 1924, attended by a violent wind squall and a remarkable heavy fall of hail, which has led to an examination of the record of hail at this station.

Hail has fallen in New Orleans or its immediate vicinity about once a year, on the average. About 70 per cent of the occurrences of hail have been during the five-month period, March to July; January and February contribute 20 per cent, leaving 10 per cent equally divided among the remaining months except October, which has thus far no recorded occurrence of hail at New Orleans. The period of most frequent thunderstorms, embracing the summer months, is not the time of most frequent occurrence of hail in this locality. A total of 13 hailstorms has been recorded for the five months, May to September, while 18 have been recorded in March–April.

No hailstorms have been recorded at New Orleans for the morning hours between 4 and 8 o'clock, this being the time of day least favorable for the occurrence of thunderstorms. The apparent explanation for this fact is that cooling of the air nearest the ground at night opposes upward convection, so that traveling convective storms, which usually develop several hours earlier, generally exhaust their energy before early morning; and thunderstorms can not usually build up to any great height under the conditions prevailing from 4 a. m. to 8 a. m. It requires a well-developed thunderstorm to produce a fall of hail. It is interesting to note that 60 per cent of the recorded occurrences of hail in this locality have been between noon and 7 p. m. and 40 per cent from 7 p. m. to 4 a. m. A few occurrences of light hail were probably overlooked at night because comparatively few people are awake during certain hours, but in a large city the percentages given could not be much in error from this cause. Only a few of the recorded hailstorms were heavy and damaging, and these occurred late in the afternoon or early in the night and during the spring months.

Previous to the recent storm, the heaviest falls of hail in New Orleans occurred on April 16, 1879, and March 17, 1904; but these were far less heavy and damaging than the hail of April 17, 1924.

In the evening of April 17, 1924, an hour previous to the storm a narrow and rather shallow trough of low pressure was passing the station, with barometer reading of 29.81 inches, sea level, at New Orleans at 7 p. m. The temperature difference in the front and rear of this trough

was slight at the earth's surface; the thermograph trace shows a fall of only 5° F. from before the storm to about an hour after. At the Weather Bureau office, which is near the southern limit of the path of hail, there was less indication of disturbed pressure conditions than is registered with many mild thunderstorms. The pressure rose at a moderate rate and apparently continuously, with only a very slight increase in the rate of rise at the time of the storm. Thunder and lightning of a mild character occurred in the neighborhood of the office. The maximum recorded wind velocity was 18 miles an hour at 8:15 p. m. to 8:20 p. m. and scattering hail fell from 8:10 p. m. to 8:15 p. m., the hailstones being 2 inches in diameter or somewhat larger.

The path of the hail was about 6 miles wide and 25 miles long. Hail began just east of Kenner, La., shortly before 8 p. m. and passed rapidly eastward as far as Chef Menteur, lasting not more than 5 to 10 minutes at the various places along the path. The entire city of New Orleans, except the extreme southern portion where the river bends to the south, was in the path of the hail, and numerous reports were received of the hailstones fully 3 inches in diameter. In a few places the hail on the ground was reported to be 4 inches deep, impeding the advance of an automobile at North Broad and St. Bernard Streets. Many buildings have a spotted appearance on the west side, showing where the paint was knocked off. Damage of about \$7,000 was done to glass and plants of florists and in gardens. Other damages, difficult to estimate, resulted from broken windows in dwellings and other buildings; but the path of such damage was considerably smaller than the path of the hail.

The central part of the front of the thunderstorm was marked by a wind squall from the west-northwest, which reached almost tornadic force in the extreme western portion of the city and the adjoining suburbs near the upper protection levee. Numerous small houses were moved from their foundations, and several lightly built houses were scattered and destroyed. The roofs of many other houses were damaged, giving entrance to heavy rain, which increased the damage. The total losses from wind and rain may be conservatively estimated at \$100,000.

The most serious injury reported was a fractured leg, suffered by a woman in a house which was blown to pieces. Lesser injuries, due to wind or hail, occurred to about 50 other persons. To persons who viewed the wreckage, it appeared remarkable that there were no deaths or no worse injuries than occurred.

#### SEVERE HAILSTORM AT CORPUS CHRISTI, TEX.<sup>1</sup>

The most severe hailstorm that has visited the immediate vicinity of Corpus Christi occurred between 1:10 and 2 a. m., May 10. Hail, averaging a half inch in diameter, fell nearly continuously for almost an hour, associated with strong north winds, vivid lightning, and torrential rainfall (1.65 inches in 38 minutes).

The greatest damage was sustained in Corpus Christi; one greenhouse was completely destroyed, as if riddled by buckshot; dwelling houses on Nueces Bay Heights suffered loss and damage through breaking of windows and flooding of the interior by the rain. The total loss from the storm is estimated at \$15,000.

The path of the storm was a mile wide and 6 miles long. The intensity of the storm decreased very much as it moved west of Nueces Bay Heights.

<sup>1</sup> Condensed from a report by J. P. McAuffe, Meteorologist.